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35. TROZNYI SCIENTIFIC-RESEARCH PETROLEUM INSTITUTE (GROZNI)

*Kossior*  
Ismet I. V. Kossior

Iosev, P. S. and Skripnik, P. S.

The Institute was founded in 1928, using as a base the Central Laboratory of the Administration of the Grozneft' Trust, which had existed since 1920.

Among projects completed by the Oil-Fields Section of *GROZNI*  
~~GROZNI~~, the following leading projects may be pointed out:

Research on the cause of deformation of drillings of a geological as well as a technical nature. A number of precautionary measures have been developed, such as: regulation of loading on the bit, centering of the rotor and crown-blocks, etc.

The measures developed were used as a basis for an instruction adopted by the 1st All-Union Conference on Deep-Drilling.

Development has been made of a theory of bit-operation, which is facilitating the search for the most suitable form, as well as determination of the best method, of facing.

A method has been worked out of the most advantageous form of sharpening "fish-tail" bits which gives a cutting angle of 85-90 degrees for hard rocks and 70 degrees for soft ones; the angle of pointing is appropriately 40 and 20 degrees.

The best method of facing a bit with subsequent layers has been worked out, which has made it possible to lengthen the duration of service of a bit by 2 or 3 times.

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The measures developed have been approved and recommended by the <sup>2nd</sup> All-Union Conference on Deep-Drilling.

Projects have been carried out on study of methods of combatting the loss of circulation of solutions and high gas pressure.

A profound study of mud solutions has been carried out along the lines of determining the conformity to principle of the falling of hard particles in the rising current and establishment of a dependence between viscosity and the temperature of the solution.

Elaboration has been made of the problem of replacing imported aqua-gel with native earths. It has been established that with suitable treatment of local sulphur hydride earth it is possible to obtain aqua-gel of very high quality.

A study has been made of the practice of deep drilling under the conditions experienced at Grozneft'. The project was carried on in these directions: (a) establishment of the coefficient of efficiency of machines; (b) establishment of the coefficient of efficiency of lifts; (c) establishment of useful power for drilling and auxiliary operations; (d) the same, for pumping of the mud solution; (e) examination of the operation of pumps; (f) analysis of the structure of deep wells.

Investigation has been completed of the operation of the Skvortsov automatic device, which has made it possible to solve the problems: of the expediency of reversing, on differentiation of the speeds of the automatic device, and time-standards for

limiting power.

A method of cementing columns, using an accelerator, has been provided. As a result of this project, periods of hardening of cement have been reduced from 28 to 4 days. The project is being applied at all oil fields of the Union.

Due to the formation of sand plugs in petroleum wells under exploitation, the oil fields lose an enormous quantity of petroleum.

A lift of construction suggested by GROZNEF makes it possible to exploit wells so that the sand is carried off. In consequence of this removal of plugs is accomplished in the very process of removal of the petroleum, thereby eliminating shut-down of the wells. The lift has been adopted by Grozneft' for installation in all new wells, where the formation of sand plugs may be expected on the basis of geological data.

[Photo: The Grozny Scientific-Research Petroleum  
Institute.]

Work has been done of the study of how to deal with the fountain beds of Novogroznenskiy Rayon.

A project has been carried out on study of the effect of torpedoing petroleum wells for increasing the yield of petroleum from depleted deposits.

A project has been carried out on investigation of the use of low-speed pumps in Starogrozanskiy Rayon.

The Petroleum-Processing Section of GROZNEF has executed the following leading projects:

Determination of the potentialities of bright products in Groznyy petroleum. The most important index of the effectiveness of petroleum processing is maximum extraction of the most valuable commercial products (benzene, ligroin, and kerosene) in accordance with the potentialities established by the laboratory method.

Standard laboratory instruments of the Glinskiy and Gadaskin type have not been assuring detection of the actual potentialities. In particular, the lack of suitability of the Glinskiy instrument became obvious following the commencement of operation of new plant installations, the atmospheric "Badger" installation and the atmospheric-vacuum "Alko" installation, which provide a high degree of rectification. Further familiarization with these installations has also shown the lack of perfection of the Gadaskin instrument.

GROZNEF has constructed on the basis of an imported model a laboratory column of the Badger system, and two columns of pilot-plant type of original construction (10 and 5 meters in height), with which the fractional composition of different petroleum has been established.

Research has revealed a considerably higher content of bright products in the petroleum than had been shown by the Glinskiy

and Gadaskin instruments; the under-extraction of bright products reached 7.4% for the Badger installation and 2.83% for the Alko, as a proportion of the petroleum.

Study of the operation of plant installations (Badger and Alko) has led to determination of the basic inadequacies of the technological process adopted at these installations. As a result, means of increasing the extraction of bright products have been pointed out.

A project on benzine-kerosene production. A project has been carried out on dehydration of the Baku emulsive petroleum which is received at the Groznyy plants.

The emulsion of Baku petroleum (Kala) is distinguished by great stability and contains considerable amounts of mineral admixtures. The water and cinders contained in the petroleum regularly interrupt the normal operation of plant equipment. As a dehydrator cracking-residue has been suggested, addition of which in the amount of 3 to 5% with suitable temperature regulation and residue lowers to a minimum the content of water and cinders in the petroleum. Thanks to this, the effect of operation of the equipment is increased.

On the problem of elimination of the corrosivity of petroleum-distilling apparatus, the Institute has found that introduction into the petroleum of 0.01-0.02% of alkali reduces corrosivity by 90 percent.

Both of these projects have been adopted in the practice of

the Grozny plants.

Study of cracking problems was defined as the overall task of increasing the extraction of benzine from available crude products. This project has been carried on along the lines of cracking, as well as along the lines of hydrogenation.

Along the lines of hydrogenation a study has been conducted of the conditions of the process, and the quantity and quality of the products obtained from different raw material. Determination has been made of the yield and quality of benzines from residue of the cracking of paraffin maseout, from coke distillates, and from paraffin distillate.

The low qualities of the products obtained from this raw material have made it necessary to shift the project in the direction of research on the conditions and products of solar oils from Grozny petroleum oil. In this process, benzine up to 85 percent was obtained, with an octane number of 82. The whole method of hydrogenation has been developed at GROZNI<sup>I</sup>.

Research on cracking has emphasized the study of actual equipment, mainly of the Winkler-Koch system. The quantities and qualities of cracking products from Winkler-Koch equipment have been established. The peculiarities of individual assemblies of the equipment (large and small evaporator ovens, the column) have been made known and their operation has been evaluated. As a result, means are being considered for improving the operation of the equipment as a whole.

Investigation of the raw material for cracking according

to methods of cracking and recycling have made it possible to approach the problem of determining the maximum yield of benzines (potentials of benzine in the raw material) as applied to plant conditions of the operation of Winkler-Koch installations.

The problem of purification of cracking-benzines has received consideration in a project for study of existing methods of purification. It has been established that benzines of Type II acid purification preserve stability for a period of 5 to 6 months in storage, as against a maximum 3 months for lightened and plumbite benzines. As a result of research it has been established that for prolongation of period of storage of cracking-benzines the application of inhibitors is necessary. The inhibitors used by GROZNI<sup>I</sup> have provided storage of cracking-benzines up to one year.

A GROZNI<sup>I</sup> project on obtaining synthetic oils is the largest project completed in the Institute; a method has been developed of obtaining valuable synthetic oils from ligron-kerosene fractions from the cracking of paraffin raw material. Concurrently with the recovery of synthetic oils gasoline of high export quality has been obtained.

Projects in the field of oil production. Oil fractions from different raw material (mazouts of a petroleum-asphalt, naphtha, and paraffin base) have been investigated. Projects have been conducted on study of the conditions of deparaffinization of the distillates of Groznyy paraffin-containing petroleum with the help of earths.



Projects on asphalt production have provided means of developing asphalt production in Grozny; specifications for asphalts and methods of obtaining them have been given.

Projects on paraffin production have been utilized in the planning of a paraffin plant. Study of production processes has established the necessity of accurate control of crystallization, filtration, and temperature regulation in sweating chambers.

[Photo: An installation for obtaining synthetic oils.  
An oven for cracking. GROZNI<sup>I</sup>.]

Research on coking processes. Recovery of petroleum coke, which has been mastered in recent years, has been involved with heavy losses, since under the action of the high temperatures of coking the bottoms of the stills would rapidly burn up. The duration of operation of the stills did not exceed a year-and-a-half. Institute projects have established the possibility of reducing coking temperature from 1200 to 720 degrees, thanks to which the wearing-out of the bottoms of stills does not set in in 90 days, but in 2½ years; the period of operation of the stills is extended to 10 years.

The problem of the quality of petroleum products has been worked out by GROZNI<sup>I</sup> along the lines of detailed investigation of the chemical composition and detonating properties of directly distilled benzines, ligroins, and kerosenes from petroleum of the most important fields of the Union (Baku, Grozny, Emba, Maykop). The following results have been obtained:

1. A close relationship has been established between the chemical content of benzines from the petroleum of different fields and their detonating properties have been determined. It has been established that light Baku benzines have an octane number of from 70 to 80 and are an exceedingly good automobile and aviation fuel. Groznyy and Maykop benzines have low octane numbers which vary in the range from 63 to 42. Removal of the detonating fractions from paraffinous benzine makes it possible to increase its octane number to 72; however, this leads to reduction of yields of it.

2. With respect to tractor fuel it has been established that kerosene from Groznyy petroleum are completely unsuited to these purposes and it is suggested that Baku kerosene, which possesses high anti-detonating properties, be used exclusively as a tractor fuel.

3. A project performed in the same direction on investigation of tractor ligroins has made it possible to establish that Groznyy ligroin from direct distillation of paraffinous petroleum is also unsuitable as tractor fuel for a determinate type of engines.

These projects have served as material for development of standards and have led to re-inspection and re-distribution of the commercial resources of automobile and aviation fuel available in the country. A direct consequence of all these projects is the improvement of operation of engines in automobile and aviation transport and in our agriculture's tractor pool.

35. GROZNYI SCIENTIFIC-RESEARCH PETROLEUM INSTITUTE

in. I. V. <sup>KANDYBA</sup> ~~NOSEKIN~~ (GROZNYI)<sup>I</sup>

City of Grozny

GROZNYI<sup>I</sup> is under the Grozneft' Trust (in the Glavneft' system).

Director -- Chubarov, A. P.

Deputy Directors for the Scientific Division -- Lecturer Tarasov, B. K. (for processing) and Engineer Bezdrobnyy, I. A. (for the oil-field section).

GROZNYI<sup>I</sup> CONDUCTS SCIENTIFIC-RESEARCH PROJECTS ON PROBLEMS OF PETROLEUM GEOLOGY, PETROLEUM PROSPECTING, ON DEEP DRILLING, SECONDARY METHODS OF DEVELOPMENT OF DEPOSITS, ON GAS-LIFTING, ON INTENSIFYING THE EXTRACTION OF BRIGHT PRODUCTS, NEW METHODS OF PURIFICATION, ON STUDY OF THE PHYSICO-CHEMICAL PROPERTIES OF PETROLEUM PRODUCTS.

Scientific Departments and Laboratories

Laboratories:

Testing Materials

Geological

Drilling

Exploitation

## Colloid Research

### Processing Section

#### Laboratories:

Gas

Synthetic Oils

Physics

Cracking

Pyrolysis and Hydrogenation

Paraffin

Primary Processing

Analytical

Fuel Testing

### Economic Research Section

#### Managerial Scientific Workers

Lecturer Tarasov, B. K. -- Manager of the Processing Department

Baranov, V. S. -- Drilling

Bezdrobnyy, I. A. -- Manager of the Oil-Fields Department

Bezruchenko, N. G. -- Physics

Voronov, A. I. -- Oil Technology

Gabrielyants, S. M. -- Natural Gases

Govakov, V. P. -- Bright Fuels

Zherdeva, L. G. -- Manager of the Synthetic Oils Laboratory

Lisitsyn, P. S. -- Benzine-Kerosene Production

Losev, P. S. -- Technical Standardization and Petroleum Production

Makarov, I. P. -- Oil-Field Geology

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Maslov, P. S. -- Bright Products

Ravikovich, A. M. -- Paraffins

Sentsov, P. A. -- Cracking

Starostin, I. I. -- Analytical Chemistry, Petroleum Coke

Strigotskiy, A. A. -- Testing Materials

Fedorov, V. S. -- Manager of the Drilling Laboratory

Chegodayev, A. M. -- Exploitation of Oil Wells

#### GRAZNI

#### Gresin Experimental Installations

Installation for recovery of aviations oils from paraffinous distillates by means of deparaffinization of them with selective solvents.

Cracking installation for recovery of synthetic oils (for preparation of semi-finished products). Continuous fractionalization and cracking.

Complex installation for recovery of synthetic oils according to L. G. Zherdeva's method.

Installation for purification of cracking-benzines with zinc chloride.

Experimental petroleum processing, including an oil pipe-still, a distillation apparatus, a rectification column, two-column equipment for obtaining ethers, a still for obtaining individual hydrocarbons.

Experimental drilling tower.

Experimental oil-bed with absorber and compressor.

Experimental air-lift.

Overall Number of Workers -- 355

Scientific Workers -- 80

Annual Budget -- 1,734,700 rubles

Diagram of GROZNIN<sup>I</sup> Experimental Oil-Bed.

1. Experimental Bed. 2. Gas Generator. 3. Compressor
4. Pump. 5. Gas Meter. 6. Hydraulic Press. 7. Measuring Tank for Petroleum. 8. Measuring Tank for Water. 9. Reversing Valve. 10. Reduction Valve.
11. Needle Valve. 12. Manometer. 13. Trap.
14. Measuring Cylinder. 15. Sand. 16. Vapor Coil.

GROZNIN  
Basic Problems Being Solved By Groznin At Present

Newest methods of correlation (micro-fauna and petrography) of veins and beds of petroleum and gas deposits, -- manager, Makarov, I. P.

Study of lithology, flora, and fauna of petroleum deposits -- manager, Makarov, I. P.

New methods of prospecting -- managers, Gabrielyants, S. M., Makarov, I. P.

Drilling of petroleum wells - managers, Fedorov, V. S. Strigotskiy, A. A.

Reaction of air on petroleum when forced into the oil-bed according to the Mariette method, and other problems of exploitation, -- managers, Chagodayev, A. M., Besruchenko, N. G., Ravikovich, A. M.

Project on refining ligroin distilled directly from Groznyy paraffinous petroleum at the Vickers cracking-installation -- manager, Sentsov, P. A.

Study of the processes of coking, -- manager, Starostin, I. I.

*IT  
AIR*  
Project on study of the conditions of recovering high-grade aviation oils from the cylinder distillate of the Alko installation, -- managers, Voronov, A. I., Govakov, V. P.

Study of the conditions of converting paraffinous filtrate, by means of deparaffinization, into valuable (transformer) oils, -- managers, Voronov, A. I., Govakov, V. P.

Investigation of the operation of various types of motors with samples of Groznyy tractor fuel, -- manager, Govakov, V. P.

Corrosion of oil-field and plant apparatus and equipment, -- manager Lisitsyn, P. S.

*GROZNI*  
Enterprises Regularly Served by Groznyy

Grozneft' Oil-Fields: Oktyabrskiy, Staropromyshlennyy, Malgobekskiy, Voznesenskiy, Prospecting Regions.

Experimental Air-Lift Installation. 1. Exhaust line.  
 2. Air Separator. 3. Coil. 4. Manometer. 5. Mercury Manometer.  
 6. Pressure Column. 7. Glass. 8. "Emka" Meter. 9. Foxboro  
 meter. 10. Wescott Meter. 11. Siemens and Halske water meter.  
 12. Woltman water meter. 13. Meter for defective water meters.  
 14. Water entrance. 15. To drain. 16. Air entrance.

Grozneft' Plants: 1st Petroleum Distilling, 2nd Cracking,  
 3rd Petroleum Distilling (Tuapse), 4th Petroleum Distilling  
 (Makhach-Kala), 5th Petroleum Plant (Krasnodar), Gas Plants  
 (1--6).

Technical Assistance Is Rendered To Industry By <sup>GROZNEFT</sup> ~~Grozneft~~ On The  
Following Problems

Determination of the salinity curves of underground  
 waters.

Application of electro-prospecting for locating petroleum.

Failures of carottage apparatus and controlling them.

Theory and practice of the operation of rotary-drilling  
 bits.

Facing bits with hard alloys.

Problems of drilling practice.

Fixing deformed wells.

Selection of the method of exploitation of wells.



Problems of the exploitation of petroleum and gas deposits  
and well drillings.

Determination of the suitability of crude materials for  
cracking.

Fractional composition, detonating characteristics, and  
methods of testing automobile and tractor fuel (benzines, ligroins,  
and kerosenes).

Production of petroleum coke and methods of its analysis.

Characteristics of the petroleum of regions under ex-  
ploitation in the northern Caucasus.

Investigation of the illuminating properties of kerosenes.

Thermal and technological values of the operation of oil-  
processing equipment.

Testing measurement apparatus used in the petroleum in-  
dustry.

Purification of benzines and kerosenes produced by cracking,  
and their stability.

Methods of detecting potential and dissolved tars.

Recovery of synthetic oils and cracking-kerosene in the  
presence of aluminum chloride.

Chemical composition of paraffins, analysis of paraffin-oil  
mixtures and petroleum for paraffin-content.

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Analysis of hydrocarbon gases and methods of selecting

gas-samples. Recovery of naphtha soap and problems of the leaching of petroleum. Determination of oil losses, purification and deparaffinisation of oils. Application of selective solvents. Methods of obtaining asphalt bitumens and research on them.

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